



# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### Improvements in or relating to a Machine for making Coffee, Tea, and like Beverages

We, RUDD-MELIKIAN, INC., a corporation of the State of Pennsylvania, United States of America, of Jacksonville Road, Hatboro, Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to beverage dispensers and is particularly concerned with the type of beverage dispenser in which a quantity of beverage is brewed from a unit charge of beverage material and a predetermined amount of an extracting fluid.

The invention is especially adapted for use in dispensing coffee, tea, and other beverages of the kind which are produced by preparing a water extract of the water-soluble constituents of a solid beverage material.

By means of the invention, a beverage is dispensed by extracting the water soluble constituents of a discrete mass of beverage material, such as ground coffee or tea leaves, which mass, for convenience called herein a cartridge, is one of a plurality of such masses carried by an elongated carrier, an assembly of such cartridges with their carrier being termed herein a cartridge assembly.

The cartridge assembly is translated into, through, and from an extraction zone defined by a pair of members relatively movable toward one another to form an extraction zone or chamber embracing a beverage cartridge.

Mechanism is provided for controlling the sequence of operations so as to insure that the beverage cartridge is in the proper position relative to the members forming the extraction zone when the latter interengage and while the extraction operation takes place.

According to the invention there is provided a beverage dispenser for applying an extracting fluid sequentially to cartridges of beverage material serially mounted in an elongated car-

rier, wherein said dispenser has a pair of members adapted for movement relative to each other to form an extraction chamber for the cartridges, one of said members having an inlet port for the introduction of the extracting fluid, the other member having an outlet port for the fluid, and indexing means to advance the cartridges successively into and out of the extraction chamber.

The invention will be understood more fully from the description which follows and from the accompanying drawings, in which

Figure 1 is a vertical sectional view of a machine constructed in accordance with the invention, certain parts appearing in elevation;

Figure 2 is a face view of Figure 1 looking toward the right in Figure 1;

Figure 3 is a fragmentary plan view of Figure 2 with the extracting head omitted; and

Figure 4 is a diagrammatic asymmetric view of mechanism for stripping a protective film from a cartridge assembly.

The dispenser comprises a frame structure generally indicated at 10, on which are supported an indexing head generally indicated at 11 and an extracting head generally indicated at 12. Heads 11 and 12 cooperate with an expendable cartridge assembly generally indicated at 13 to produce and dispense a beverage.

As may be seen in Figure 2, cartridge assembly 13 comprises a series of cartridges 14, containing a beverage material such as ground coffee. Assembly 13 is formed from two continuous strips of a fluid permeable material, such as paper, adhesively secured to one another along their edges and transversely between cartridges 14 in a manner to provide a space within each cartridge 14 for a predetermined amount of a beverage material. The cartridge assemblies may be made in any convenient length according to the service for which the assembly is intended; for example if it is desired to provide a coffee dispensing

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machine capable of dispensing 100 cups of coffee between servicings, then a cartridge assembly 25 ft. in length, on which the cartridges are spaced on 3" centers will provide the necessary capacity.

In Figure 2, a cartridge assembly 13 is shown in operating relationship with indexing head 11, which relationship is maintained by the cooperation between pins 15 on indexing head 11 and punched apertures 16 in cartridge assembly 13. In the illustration of Figure 2, indexing head 11 is mounted for rotation in a clockwise direction by means of a shaft 17 which is journaled in bearing assembly 18, provided with bearing sleeves 18a and supported by frame structure 10.

Indexing head 11 is adapted to be rotatively driven (in the clockwise direction as viewed in Figure 2) by a Geneva movement which comprises a Geneva wheel 19, mounted for rotation with shaft 17. Geneva wheel 19 is driven by pin 20, mounted on crank 21, which crank is mounted for rotation with main drive shaft 22 which is supported by bearing sleeves 23 in bearing assembly 18. Main drive shaft 22 is adapted to be rotated by a reduction gear motor generally indicated at 24. As may be seen from Figure 2, when shaft 22 rotates (counter-clockwise as shown in Figure 2), pin 20 engages successively the six slots 26 of Geneva wheel 19 and thereby produces one-sixth of a revolution of wheel 19 with each revolution of shaft 22. Furthermore, the Geneva movement provides for the drive of shaft 17 in such a manner that the shaft 17 is stationary during 240° of the rotation of shaft 22. Accordingly, during one complete revolution of main drive shaft 22, indexing head 11 occupies one of six possible indexed positions during two-thirds of such revolution of shaft 22; and during the remaining one-third of the revolution of shaft 22, indexing head 11 is stepped from one such possible position to the next succeeding such possible position.

Indexing head 11 is formed with six contiguous plane surfaces around its periphery, each one of which provides a station 25 for the reception of a beverage cartridge. At each station there is provided a cup 27 of generally spherical section, (see Figure 1), from which communication to the interior of indexing head 11 is provided by means of a duct 28. Each station is also provided with a circular screen 29 which is secured in its position in cup 27 by means of spring clips 30 which extend into duct 28. Spring clips 30 are adapted to secure screen 29 in cup 27 during operation of the dispenser and at the same time permit ready removal of the screen for cleaning.

Each of the six stations of indexing head 11 is successively advanced into the extraction position, i.e. the position in which the cup 27 is at the top of indexing head 11 as illustrated in Figures 1 and 2 and in which duct 28 ex-

tends downwardly in the vertical direction. Immediately below the position occupied by the duct 28 of a station 25 of indexing head 11 when such station is in extraction position is a funnel-conduit assembly generally indicated at 31, including a funnel portion 32, a duct 33, supported on a standard 34 and a nozzle portion 35 disposed in dispensing relationship to the position of a drinking cup 36 supported on the frame 10.

Extracting head 12, which is disposed generally above indexing head 11 is supported by an arm 37 pivoted to bearing assembly 18 by a pivot pin 38. Extracting head 12 is adapted to be pivoted about pivot pin 38 by means of a link 39 pivotally secured at its upper end to arm 37 by pin 39a and at its lower end to a yoke member 40 by means of a pivot pin 39b. At its lower extremity, yoke 40 carries a cam follower roller 41 mounted for rotation on yoke 40 by means of a pin 42.

Roller 41 engages a cam groove 43 in a cam 44 which is mounted for rotation with main drive shaft 22. The profile of the slot 43 may be seen in Figure 2.

When cam 44 rotates through a complete revolution it will be seen that arm 37 and hence extracting head 12 go through a cycle which, beginning with the position illustrated in Figure 1, includes a downward movement, a dwell at the lower extremity of such movement (as illustrated in Figure 2) a retracting movement to restore extracting head 12 to the position indicated in Figure 1, and a dwell in said retracted position. Extracting head 12 includes a fluid dome 45 provided with a gasket 46 which may be an "O" ring or quad-ring, adapted to engage whichever one of the six plane surfaces of indexing head 11 is presented uppermost, in a continuous line surrounding screen 29. Fluid dome 45 is mounted on a sleeve 47 which telescopically engages a hood 48 which is rigidly secured to arm 37. Telescopic movement of dome 45 and sleeve 47 into hood 48 is resisted by coil spring 49 which reacts between a shoulder 50 on hood 48 and a shoulder 51 on sleeve 47.

Extracting head 12 also includes a valve member generally indicated at 52 having a head 53 adapted to engage valve seat 54 of dome 45. Valve 52, through its stem 55, is secured to hood 48 by a screw 56.

When extracting head 12 is moved downwardly by means of the cam and follower mechanism above described, hood 48 and valve head 53 move as a unit until gasket 46 comes in contact with the surface of indexing head 11. At this point downward motion of dome 45 ceases. Downward motion of hood 48, however, continues, and with it downward motion of valve 52, the spring 49 being accordingly compressed. Such downward movement of valve 52 effectively separates valve head 53 and seat 54, permitting extracting fluid (which is supplied to the interior of extracting head

12 by a conduit 56) to pass into and through pressure dome 45. The required pressure on the extracting fluid may be developed by a pump, generally indicated at 57.

5 The dispensing apparatus of the invention is readied for service by threading the end of a cartridge assembly 13 over the top of indexing head 11 so that the first cartridge 14 is in juxtaposition to screen 29 of the station of the indexing head which is in uppermost position, in such a manner that the apertures 16 of cartridge assembly 13 are penetrated by pins 15 of indexing head 11.

15 The dispensing apparatus of our invention is specifically adaptable to automatic operation, i.e. operation with a system of electrical control providing for the dispensing of a cup of beverage responsive to the actuation of a single control member. For this purpose motor 24 may be provided with a conventional circuit arranged so that when the main control switch or push-button, or coin-operated switch, is actuated, motor 24 operates for a period of time such as to provide for one complete revolution of main drive shaft 22, after which motor 24 is de-energized.

25 Such a circuit, as illustrated in Figure 1, may include a segmental switch 58 and an actuating push-button 59. Segmental switch 58, which may be mounted within the housing of motor 24, is arranged so that the segmental contact 58a is fixed against rotation and the moving contact 58b rotates in synchronism with main drive shaft 22. The switch 58 is arranged so that when the dispensing apparatus is in the at-rest position illustrated in Figure 1, moving contact 58b is between the ends of segmental contact 58a. If, now, push-button 59 be momentarily actuated, the circuit to motor 24 will be completed and the motor will begin to rotate. The motor will then continue to receive energization through segmental switch 58, even though push-button 59 has been released. When moving contact 58b completes a full revolution and again occupies the position illustrated in Figure 1, the circuit to motor 24 is interrupted and the apparatus is again at the position illustrated in Figure 1. At this point a spent cartridge 14 is at the uppermost station of indexing head 11. In this condition pin 20 is about to enter the slot 26 of Geneva wheel 19 which is at the position indicated by 26a in Figure 2. In a typical case the control system is arranged to provide for one complete rotation of main drive shaft 22 in eight seconds. This means that the dispenser of the invention can dispense cups of beverage at intervals of eight seconds.

60 With the apparatus in this condition, when the circuit for motor 24 is energized and shaft 22 begins to rotate in the counter-clockwise direction, pin 20 enters slot 26, and during the next 120° of rotation of shaft 22, causes indexing head 11 to rotate in a clockwise direction by 60°, bringing the next station to the

extracting position and thereby supplying a fresh cartridge 14 for the extraction operation. During the first 90° of rotation of main drive shaft 22 from the starting position just described, cam follower 41 rides the high portion of groove 43. Beginning at about 90° after rotation has started cam follower 41 begins to follow slot 43 toward the lower position and consequently extracting head 12 begins to move toward indexing head 11.

70 When main drive shaft 22 has rotated through 120° from the starting position and when pin 20 has thus just cleared the position of the Geneva slot 26 which is now in the position at 26b in Figure 2, cam follower 41 is well toward the low point of its travel, and extracting head 12 is well toward engagement with indexing head 11. As main drive shaft 22 continues to rotate, extracting head 12 continues to move downwardly, and gasket 46 of fluid dome 45 now engages the surface of indexing head 11 around the uppermost extraction station. With this engagement, downward movement of fluid dome 45 ceases; further downward movement of hood 48 and valve 54 continues, so that valve head 53 becomes separated from seat 54, permitting extracting fluid to flow downwardly under pressure through the upper permeable layer 60 of cartridge 14, through the beverage material 61 contained in the cartridge, through lower permeable layer 62, and through screen 29 from which the fluid extracted from the beverage material 62 runs down the inner surface of cup 27, through duct 28, into funnel 32 and through conduit 33 and nozzle 35 to the cup 36.

100 Meanwhile, main drive shaft 22 has continued to rotate, and by the time the desired quantity of fluid has passed through the extraction zone, cam 44 has no effect on fluid dome 45, but since extraction head 12 is rising, valve head 53 also rises until it engages seat 54 shutting off the flow of fluid. Thereafter, as the upward movement of extracting head 12 continues, fluid dome 45 is lifted clear of indexing head 11, and by the time the control circuit de-energizes motor 24, dome 45 will have resumed the position illustrated in Figure 1.

115 Our invention is useful in the dispensing of beverages under conditions such that relatively long periods of time—of the order of days—may elapse between servicings of the machine. It may thus become desirable to provide a greater degree of protection for material in the cartridges than can be provided by the permeable layers thereof.

120 Under these circumstances, there may be provided an impermeable sheath for the cartridge assembly, such a sheath being illustrated in Figure 4. The sheath may comprise two strips 63 of impermeable material, such as aluminium foil or polyethylene film, adhesively secured to one another at their edges as at 64. The ends of the strips may also be secured to

one another; we have illustrated such end treatment at 65 in Figure 4. It will be understood that both ends of the sheath are so treated at the time of manufacture; and that the space within the sheath may be evacuated or charged with an inert gas to protect the contents until the cartridge is threaded into the dispensing apparatus.

A modification of the dispensing apparatus of our invention which utilizes such sheathed cartridge assemblies is also illustrated in Figure 4. Such modification includes, on each side of the supply run of the cartridge assembly, i.e. the run on the way to the extraction position, a pair of rollers, each of which pair is adapted to grippingly engage one of the impermeable strips 63 and strip it from the other and from cartridge assembly 13. The outer rollers 66 of each pair are driven in synchronism with indexing head 11, so as to take up, during each advancing step of indexing head 11, a length of sheathing material equal to the distance between centers of adjacent cartridges 14 of cartridge assembly 13. The inner rollers 67 of each pair are idlers which may be resiliently urged against the drive rollers 66 by any convenient means.

When a dispenser embodying the modifications of Figure 4 is put in service, the sealed leading end of the cartridge is opened by separating the two shield strips 63 and threading them into the nips between the two pairs of rollers. At the same time the cartridge proper is threaded onto indexing head 11 as described above. Operation of the modified apparatus proceeds as above described with the addition that, with each actuation of the mechanism, the roller pairs 66-67 withdraw from the cartridge assembly a length of the protective covering strips 63.

In the specification of our copending Patent Application No. 22395/63 (Serial No. 939,814), divided on the present application, there is disclosed a cartridge assembly suitable for use in the dispenser of the present invention.

#### WHAT WE CLAIM IS:—

1. A beverage dispenser for applying an extracting fluid sequentially to cartridges of beverage material serially mounted in an elongated carrier, wherein said dispenser has a pair of members adapted for movement relative to each other to form an extraction chamber for the cartridges, one of said members having an inlet port for the introduction of the extracting fluid, the other member having an outlet port for the fluid, and indexing means to advance the cartridges successively into and out of the extraction chamber.

2. A dispenser according to claim 1, wherein an indexing head is provided to carry said cartridge assembly and said indexing head has

a beverage cartridge station which comprises the member having the outlet port, and the indexing head is movable to bring the cartridge station into position with the member having the inlet port to form the extraction chamber and then to remove the cartridge station after extraction.

3. A dispenser according to claim 2, wherein means are provided to position a cartridge in said beverage station each time that the indexing head moves to form the extraction chamber.

4. A dispenser according to claim 2 or 3, wherein the indexing head is mounted for turning movement on the dispenser and has a plurality of said beverage stations on the periphery thereof.

5. A beverage dispenser according to claim 4, including a rotary shaft for rotation of the indexing head, said shaft being operatively connected to the member having the inlet port.

6. A dispenser according to claim 5, wherein a Geneva movement is provided for rotation of the indexing head.

7. A dispenser according to claim 5 or 6, wherein the connection between the shaft and the member having the inlet port comprises a cam and link arrangement.

8. A beverage dispenser according to claim 5, 6 or 7, wherein the shaft is motor operated and stopping means are provided to stop the motor after a predetermined rotation of the shaft thereby initiating and insuring completion of the dispensing of one beverage portion and thereafter to assume a position where action by an operator is required before the next dispensing cycle is initiated.

9. A beverage dispenser according to any of claims 2 to 8, wherein the carrier is moved by the indexing head to place the cartridge in the extraction zone through pin means co-operating with apertures formed in the carrier.

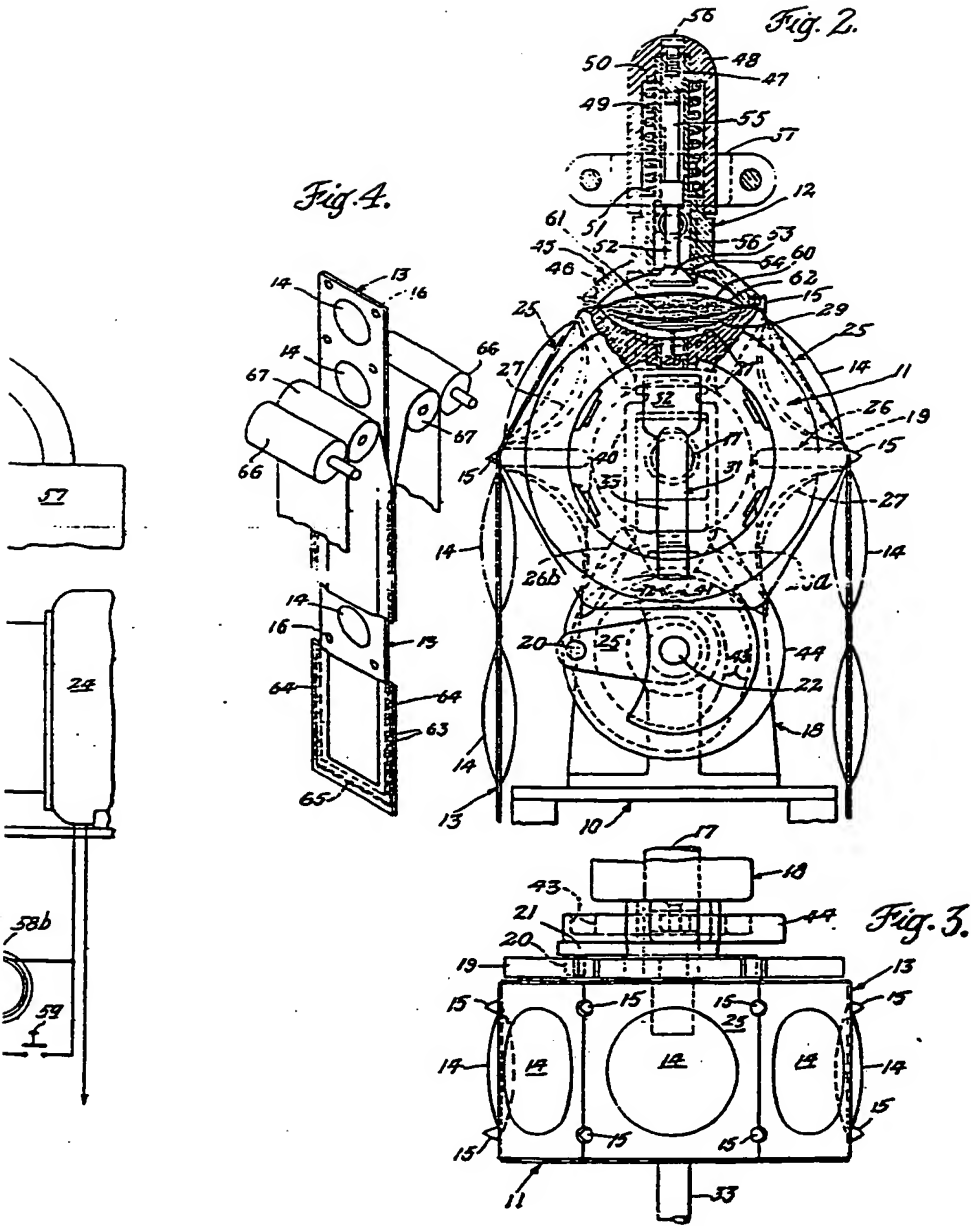
10. A dispenser according to any of the preceding claims, wherein there is provided stripping means to strip fluid impervious covers from the cartridges before the same are placed in the extraction chamber.

11. A beverage dispenser as claimed in any one of the preceding claims, wherein said inlet port has a valve adapted to be opened only after the member having the inlet port and member having the outlet port have moved to the position to form the extraction chamber and are in tight sealing engagement.

12. A beverage dispenser substantially as herein described with reference to the accompanying drawings.

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 This drawing is a reproduction of  
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